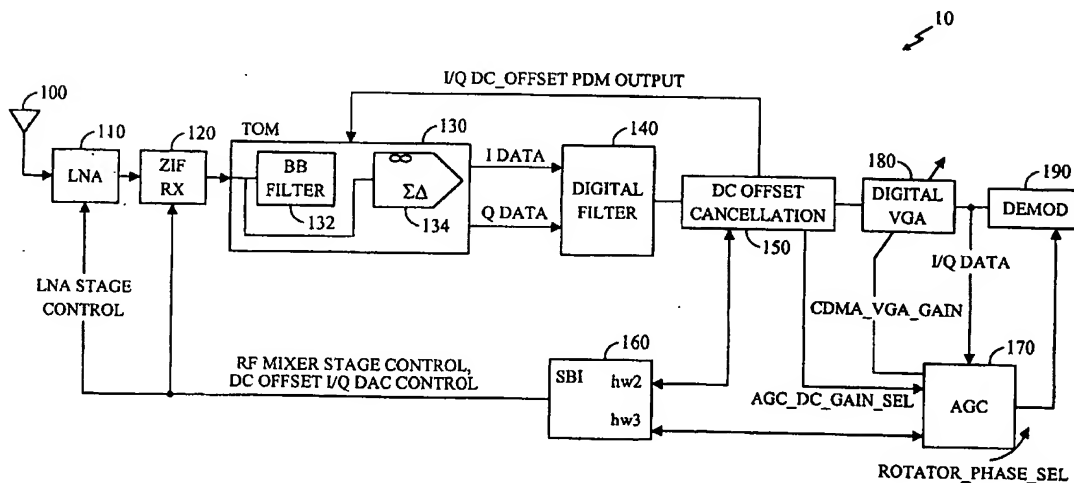




US 20030100286A1

(19) **United States**(12) **Patent Application Publication**
Severson et al.(10) **Pub. No.: US 2003/0100286 A1**(43) **Pub. Date: May 29, 2003**(54) **DIRECT CONVERSION OF NARROW-BAND
RF SIGNALS****Related U.S. Application Data**(60) Provisional application No. 60/333,723, filed on Nov.
27, 2001.(76) Inventors: **Matthew L. Severson**, Oceanside, CA
(US); **Inyup Kang**, San Diego, CA
(US); **Arun Raghupathy**, San Diego,
CA (US)**Publication Classification**(51) **Int. Cl.⁷** **H04B 1/26**(52) **U.S. Cl.** **455/324; 455/323; 455/313;
455/325****Correspondence Address:****Sarah Kirkpatrick****Intellectual Property Administration****QUALCOMM Incorporated****5775 Morehouse Drive****San Diego, CA 92121-1714 (US)***Assignee*(57) **ABSTRACT**

A method and device for converting at least one narrow band RF signal, being suitable for transmission between at least one communications device suitable for receiving wide-band RF signals and at least one base station, to baseband. The method includes directly down-converting a signal spectrum including the at least one RF narrow-band signal to baseband such that the at least one narrow-band RF signal results at a low intermediate frequency (IF). And, digitally phase rotating the down-converted signal spectrum such that the at least one narrow-band RF signal is phase rotated from the low-IF to baseband.

(21) **Appl. No.: 10/067,611**(22) **Filed: Feb. 4, 2002**



US006560447B2

(12) **United States Patent**
Rahman et al.

(10) Patent No.: **US 6,560,447 B2**
(45) Date of Patent: **May 6, 2003**

(54) **DC OFFSET CORRECTION SCHEME FOR WIRELESS RECEIVERS**

(75) Inventors: **Mahibur Rahman**, Boynton Beach, FL (US); **Christopher T. Thomas**, San Diego, CA (US); **Robert Schwelckert**, Mesa, AZ (US); **James Mittel**, Lake Worth, FL (US); **Clinton C. Powell, II**, Lake Worth, FL (US)

(73) Assignee: **Motorola, Inc.**, Schaumburg, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 94 days.

(21) Appl. No.: **09/798,216**

(22) Filed: **Mar. 5, 2001**

(65) **Prior Publication Data**

US 2002/0151289 A1 Oct. 17, 2002

(51) Int. Cl.⁷ **H04B 1/06**

(52) U.S. Cl. **455/232.1; 455/240.1; 375/319; 375/345**

(58) Field of Search **455/232.1, 234.1, 455/239.1, 240.1, 296, 250.1, 251.1, 255, 256, 266, 313, 334, 339; 375/319, 324, 345, 346**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,471,665 A	11/1995	Pace et al.	455/343
5,724,653 A *	3/1998	Baker et al.	455/296
6,009,126 A *	12/1999	Van Bezooijen	375/319
6,081,558 A	6/2000	North	375/316
6,366,622 B1 *	4/2002	Brown et al.	375/345

FOREIGN PATENT DOCUMENTS

GB	2328353 A *	2/1999	H04L/27/38
----	-------------	--------	------------

* cited by examiner

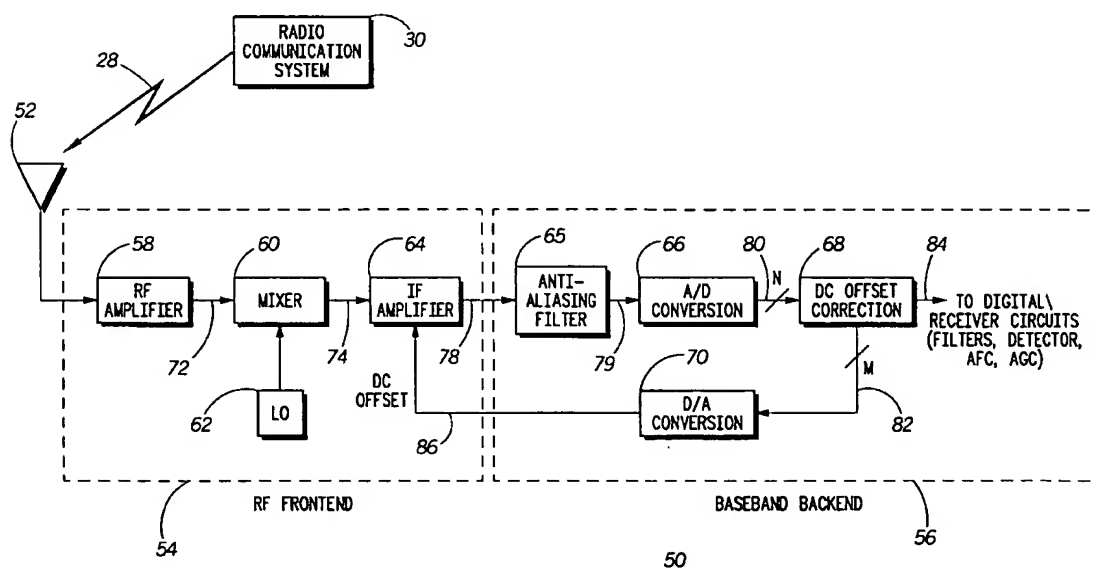
Primary Examiner—Quochien Vuong

(74) *Attorney, Agent, or Firm*—Randi L. Dulaney

(57) **ABSTRACT**

A DC offset correction circuit (68) provides DC offset correction within a receiver (50) for receiving and processing a radio frequency signal (28) within a radio communication system (30). The DC offset correction circuit (68) includes a feedback loop (88) for shifting a digital signal (80) by a programmable amount; and a coarse DC offset correction path (104) coupled to the feedback loop (88) for performing coarse DC offset correction.

8 Claims, 7 Drawing Sheets



United States Patent [19]

Gehring et al.

[11] Patent Number: 4,944,025

[45] Date of Patent: Jul. 24, 1990

[54] DIRECT CONVERSION FM RECEIVER WITH OFFSET

[75] Inventors: Mark R. Gehring, Portland; Richard R. Suter, Beaverton, both of Oreg.; Lawrence H. Ragan, Richardson, Tex.

[73] Assignee: AT&E Corporation, San Francisco, Calif.

[21] Appl. No.: 229,976

[22] Filed: Aug. 9, 1988

[51] Int. Cl.⁵ H04B 1/16; H03D 3/18

[52] U.S. Cl. 455/207; 455/209; 455/264; 455/316; 329/323

[58] Field of Search 455/207-209, 455/214, 47, 258, 61, 264, 316, 318, 319, 141-143, 324, 303-306, 192, 234; 329/50, 122, 124

[56] References Cited

U.S. PATENT DOCUMENTS

2,928,055 3/1960 Weaver, Jr. .
3,961,262 6/1976 Gassmann 455/207
4,462,107 7/1984 Vance .
4,476,585 10/1984 Reed .
4,521,892 6/1985 Vance et al. .
4,521,918 6/1985 Challen .
4,599,743 7/1986 Reed .
4,618,967 10/1986 Vance et al. .

4,653,117 3/1987 Heck .
4,672,636 6/1987 Marshall et al. .
4,677,690 6/1987 Reed .
4,736,390 4/1988 Ward et al. .

OTHER PUBLICATIONS

"Solid State Radio Engineering," Krauss et al., 1980, pp. 26-30.

Primary Examiner—Reinhard J. Eisenzopf

Assistant Examiner—Curtis Kuntz

Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh & Whinston

[57] ABSTRACT

A direct conversion FM receiver that includes AC coupling and automatic gain control employs an offset frequency at the first local oscillator. The offset frequency prevents the frequency spectrum occupied by the signal modulation from being affected by AC coupling. The offset frequency is chosen so that it translates the frequency spectrum of the received signal outside the DC notch created in the spectrum by the AC coupling. To conserve battery supplied power, an error amplifier coupled between the output of the receiver and the first local oscillator maintains the offset frequency after it has been established by a frequency synthesizer, which is then turned off.

10 Claims, 2 Drawing Sheets

